

REMARKS

Claims 16-19 and 22-51 are now presented for examination. Claims 16, 18, 19 and 22-27 have been amended to define still more clearly what Applicant regards as his invention, in terms which distinguish over the art of record. Claims 28-51 have been added to assure Applicant of the full measure of protection to which he deems himself entitled. Claims 16, 18, 24-28, 34, 37, 40, 46 and 49 are the only independent claims.

Claim 16, indicated as allowable, has been amended to correct an inadvertent error in referring to "said adjusting means" rather than "said changing means" in the changing means limitation. Claim 18, indicated as allowable, has been amended to clarify that the first changing means changes an incidence angle of illumination light to adjust telecentricity with respect to the on-axis-position on the basis of the result of the measurement with respect to the on-axis position and that the second changing means changes an incidence angle of the illumination light to adjust the telecentricity with respect to the off-axis position, on the basis of the result of the measurement with respect to the off-axis position. Claim 24, indicated as allowable, has been amended to clarify that the adjusting means adjusts an illuminance distribution on a substrate rather than on a surface to be illuminated. Claim 19 has been amended to correct an inadvertent error and Claims 22 and 23 have been amended to add further limitations. ~~It is not believed~~ that these amendments affect the status of Claims 16-9 and 22-24 as being allowable.

Claims 25 through 27 have been rejected under 35 U.S.C. § 102(a) as anticipated by the disclosed prior art in the specification. With regard to Claims 25 through 27 as currently amended, this rejection is respectfully traversed.

Claim 25 as currently amended is an independent claim that includes the step of exposing a wafer in exposure apparatus in which a reticle is illuminated by an illumination optical system wherein a secondary light source is produced with light from a light source by an optical integrator and an illumination range upon the reticle which is to be illuminated with illumination light from the secondary light source is restricted by masking means, a pattern of the reticle as illuminated is projected onto the wafer by a projection optical system, telecentricity of the projection optical system is measured by measuring means and an incidence angle of the illumination light is changed by changing means to adjust the telecentricity of the basis of the result of the measurement with the changing means moving an optical element disposed in a portion of said illumination optical system between the optical integrator and the masking means, along an optical axis direction.

As amended, Claim 25 recites steps performed in exposing a wafer that includes measuring telecentricity of a projection optical system for projecting a pattern of a reticle and adjusting the telecentricity by moving an optical element. It is submitted that the steps performed in the exposure apparatus in exposing the wafer clearly define the method of the invention in terms of the steps of operation of its illumination optical system, projection optical system, measuring means and changing means and that Claim 25. Similarly, it is believed that the steps of operation of the structural elements of the exposure apparatus of Claims 26 and 27 as currently

amended defines the inventive method of these claims and that the methods steps are clearly affected by the structural limitations (Leesona Corp. v U.S. 185 USPQ 156). Accordingly, it is believed that Claims 25 through 27 as currently amended are allowable.

Newly added independent Claims 28 and 40 are directed to a scan type projection exposure arrangement in which an illumination optical system having a variable illumination mode illuminates a reticle with illumination light and a projection optical system projects a pattern of the reticle illuminated by the illumination optical system onto a substrate. The illumination optical system has a movable lens which can be driven to adjust telecentricity of the projection optical system and a masking unit with a slit-like opening of a variable width to make uniform an integrated exposure amount during scan exposure. The movable lens is driven and the width of the opening is adjusted in accordance with the change of illumination mode.

Newly added independent Claims 34 and 46 are directed to a projection exposure arrangement in which an illumination optical system having a variable illumination mode illuminates a reticle with illumination light and a projection optical system projects a pattern of the reticle illuminated by the illumination system onto a substrate. The illumination optical system has a first optical element that changes the illumination mode, a second optical element that adjusts the telecentricity of the projection optical system and a third optical element that adjusts the non-uniformness of illuminance upon the image plane of the projection optical system.

Newly added independent Claims 37 and 49 are directed to a projection exposure arrangement in which an illumination optical system having a variable illumination mode

illuminates a reticle with illumination light and a projection optical system projects a pattern of the reticle illuminated by the illumination system onto a substrate. The illumination optical system has an optical member that changes the illumination mode, a first optical element that adjusts axial telecentricity of the projection optical system and a second optical element that adjusts the abaxial telecentricity of the projection optical system. The first optical element is disposed at the light entrance side of an optical integrator while the second optical element is disposed at the light exit side of the integrator.

The features of newly added Claims 28, 34, 37, 39, 46 and 49 and the claims depending therefrom are shown in at least Fig. 1 of the drawings and are disclosed in the portions of the specification corresponding thereto. No new matter is believed to have been added.

In Applicant's view, JP 70229816 (Hayata et al.) cited in the Office Action mailed December 3, 2002, discloses a projection aligner in which a pattern on the surface of a reticle is reduction projected onto the surface of a wafer by a projection optical system. The inclination angle of the main light beam is determined from the distance between the centers of effective light source images on and off the optical axis formed on the pupil plane of the projection optical system.

In Applicant's opinion, JP 6244083 (Haginiwa et al.) cited in the Office Action mailed December 3, 2002 discloses an illumination optical unit that has an illumination distribution changeable lens to adjust illuminance distribution on the surface of a wafer based on measurement results of illuminance distribution on an irradiation surface.

Hataya et al. may show use of a telecentricity measuring means with inclination angle determination and Haginiwa et al. may teach an illumination optical unit with an illumination distribution changeable lens for adjusting illuminance distribution on the surface of a wafer. Neither of these references nor any combination thereof, however, is believed to teach or suggest (1) the combination of a movable lens driven to adjust projection optical system telecentricity and a masking unit with a slit-like opening of variable width to make uniform an integrated exposure amount during scanning exposure both of which are operated in accordance with a change of illumination mode as in Claims 28 and 40, (2) the illumination optical system that has the combination of a first optical element that changes the illumination mode, a second optical element that adjusts the telecentricity of the projection optical system and a third optical element that adjusts the non-uniformness of illuminance upon the image plane of the projection optical system as in Claims 34 and 46 or (3) an illumination optical system with the combination of an optical member that changes the illumination mode, a first optical element disposed at the light entrance side of an optical integrator that adjusts axial telecentricity of the projection optical system and a second optical element disposed at the light exit side of the integrator that adjusts the abaxial telecentricity of the projection optical system as in Claims 37 and 49. Accordingly, newly added Claims 28, 34, 37, 40, 46 and 49 are believed to be allowable.

For the foregoing reasons, Applicant submits that the present invention, as recited in independent claims 16, 18, 24-28, 34, 37, 40, 46 and 49 is patentably defined over the cited art, whether that art is taken individually or in combination.

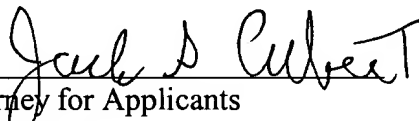
The dependent claims also should be deemed allowable, in their own right, for defining other patentable features of the present invention in addition to those recited in independent claims 16, 18, 24-28, 34, 37, 40, 46 and 49. Individual consideration of these dependent claims is requested.

Applicants further submits that this Amendment After Final Rejection clearly places this application in condition for allowance. Accordingly, entry of the instant Amendment, as an earnest attempt to advance prosecution and reduce the number of issues, is requested under 37 CFR 1.116.

Favorable reconsideration, withdrawal of the rejection set forth in the above-noted Office Action and an early Notice of Allowance are also requested.

Applicants' attorney, Steven E. Warner, may be reached in our Washington, D.C. office by telephone at (202) 530-1010. All correspondence should be directed to our address listed below.

Respectfully submitted,


Attorney for Applicants
Jack S. Cubert
Registration No. 24,245

FITZPATRICK, CELLA, HARPER & SCINTO
30 Rockefeller Plaza
New York, New York 10112-3800
Facsimile: (212) 218-2200
SEW/JSC/dc

DC_MAIN 147513v1